Paradigmatic opacity in Nuer

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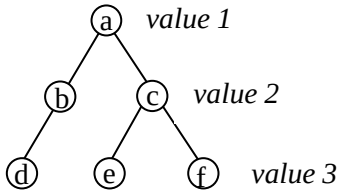
1 Paradigm Economy

Is there an upper limit on the number of inflection classes a system can maintain?

(1) Paradigm Economy Principle (paraphrased) (Carstairs 1983): the upper limit does not exceed (by very much) the logical limit needed to account for the allomorphy of any single value.

(2)

	I	II	III
1	a	a	a
2	b	c	c
3	d	e	f



(3) No Blur Principle (Carstairs-McCarthy 1994): Within any set of competing inflectional affixal realizations for the same paradigmatic cell, no more than one can fail to identify inflection class unambiguously.

(4)

system with no blur

	I	II	III	IV
1	a	b	b	b
2	c	d	c	c
3	e	e	f	e

system with massive blur

	I	II	III	IV
1	a	a	b	b
2	c	d	c	d
3	e	f	f	e

- These have proved to be too restrictive (see in particular Finkel & Stump 2007).

(5) Inflection Class Economy Theorem (Müller 2007): Given a set of n inflection markers, there can be at most 2^{n-1} inflection classes, independently of the number of instantiations of the grammatical category that the markers have to distribute over.

(6) The gist of the proposal:

a. markers may be linked to multiple values (Syncretism)
b. any competion between markers is resolved by a rule hierarchy (Specificity)
c. inflection classes consist of a list of the markers *not* used by a given lexeme

(7)

Markers	**Specificity**	**Inflection classes**	**Resulting paradigm**
a = elsewhere b = 2	b > a	I has no constraints II does not use *b*	I II 1 a a 2 b a

Given two markers, the maximal system has two values realized across two inflection classes. By contrast, without such constraints, you could generate an endless number of values and inflection classes just by jumbling around the distribution of (a,b).

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(8)

		I	II	III	IV
2 value	1	a	a	b	b
	2	a	b	a	b

(9)

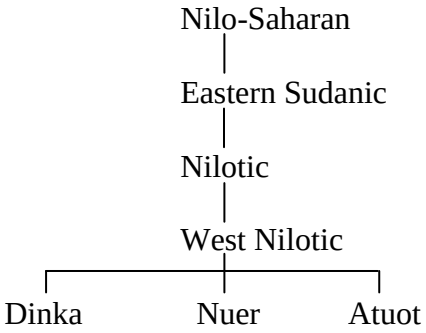
		I	II	III	IV	V	VI	VII	VIII
3 value	1	a	a	a	a	b	b	b	b
	2	a	a	b	b	a	a	b	b
	3	a	b	a	b	a	b	a	b

(10)

		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
4 value	1	a	a	a	a	a	a	a	a	b	b	b	b	b	b	b	b
	2	a	a	a	a	b	b	b	b	a	a	a	a	b	b	b	b
	3	a	a	b	b	a	a	b	b	a	a	b	b	a	a	b	b
	4	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b

2 Nouns in Nuer

(11) Genetic affiliation (Storch 2005: 17, based on earlier sources)



(12) Inflectional devices (data from Frank 1999)

	ending only	stem + ending	stem alternation only
NOM SG	jɪ̱th	läm	jiath
GEN SG	jɪ̱th-kä	läm-kä	jiaath
LOC SG	jɪ̱th-kä	la̱m-kä	jiaath
NOM PL	jɪ̱th-ni̱	läm-ni̱	jiɛn
GEN PL	jɪ̱th-ni̱	lääm-ni̱	jiɛɛn
LOC PL	jɪ̱th-ni̱	la̱m-ni̱	jiɛɛn
	'ear'	'rank'	'kind of tree'

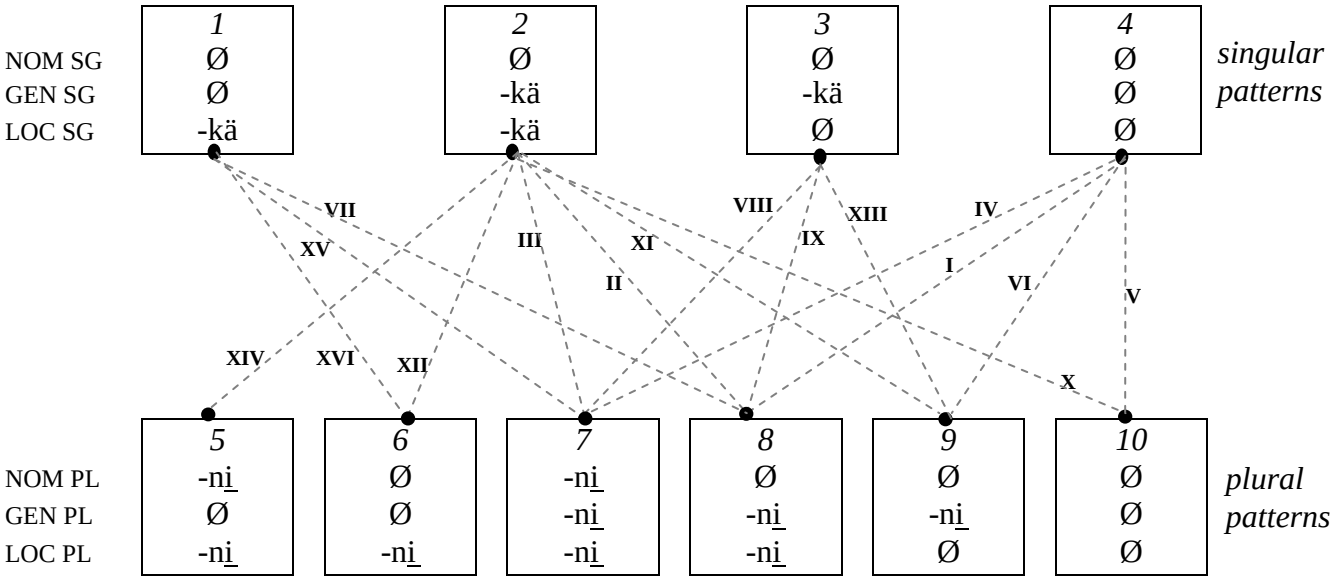
(13) Case-number endings in Nuer nouns (Frank 1999). Corpus of 252 complete noun paradigms. Out of four affixes (*Ø, -ä, -kä, -ni*)[1] we get 24 classes – the ICET predicts 16.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
NOM SG	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
GEN SG	Ø	kä	kä	Ø	Ø	Ø	Ø	kä	kä	kä	kä	kä
LOC SG	Ø	kä	kä	Ø	Ø	Ø	kä	Ø	Ø	kä	kä	kä
NOM PL	Ø	Ø	ni	ni	Ø	Ø	Ø	ni	Ø	Ø	Ø	Ø
GEN PL	ni	ni	ni	ni	Ø	ni	ni	ni	ni	Ø	ni	Ø
LOC PL	ni	ni	ni	ni	Ø	Ø	ni	ni	ni	Ø	Ø	ni
% of corpus:	24	21	18	10	4	4	4	4				

	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII	XXIII	XXIV
NOM SG	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
GEN SG	kä	kä	Ø	Ø	kä	ä	ä	ä	kä	kä	Ø	Ø
LOC SG	Ø	kä	kä	kä	kä	ä	ä	kä	ä	ä	ä	ä
NOM PL	Ø	ni	ni	Ø	Ø	ni	Ø	Ø	ni	Ø	ni	Ø
GEN PL	ni	Ø	ni	Ø	kä	ni	ni	ni	ni	ni	ni	ni
LOC PL	Ø	ni	ni	ni	ni	ni	ni	ni	ni	ni	ni	ni

- If we leave aside *-kä ~ -ä* allomorphy (and the very odd class XVII), then it's 16 classes against an ICET prediction of 8, i.e. most of the action involves *Ø, -kä, -ni*.

(14) The 16 classes can be broken down into combinations of 4 singular patterns and 6 plural patterns.



- There is a great variety of stem alternation processes and patterns, but distribution of affixes is largely independent of this:

[1] Also: plural *-ni* regularly shows the allomorph *-i* after *-l*, *-n* and *-r*.

(15) Examples of singular paradigms (invariant stems)

	1	*2*	*3*	*4*
NOM SG	nyaŋyɛt	liɛth	mɛ̈th	pät
GEN SG	nyaŋyɛt	liɛth-kä	mɛ̈th	pät-kä
LOC SG	nyaŋyɛt-kä	liɛth	mɛ̈th	pät-kä
	'ring'	'fat/oil'	'kind of tree'	'slap'

(16) Examples of plural paradigms (invariant stems)

	5	*6*	*7*	*8*	*9*	*10*
NOM PL	barkaɣ-ni	cak	gaak-ni	wiiɣ	kɛɛc	tɛɛr
GEN PL	barkaɣ	cak	gaak-ni	wiiɣ-ni	kɛɛc-ni	tɛɛr
LOC PL	barkaɣ-ni	cak-ni	gaak-ni	wiiɣ-ni	kɛɛc	tɛɛr
	'hoof'	'milk'	'flower'	'village'	'kind of tree'	'conflict

- Crazzolara (1933) and Vandevort (n.d.) describe what appear to be somewhat different varieties of Nuer, which share the following:
  - GEN/LOC SG *-kä ~ -ä* allomorphy favours *-ä* (mirror image of Frank 1999 material)
  - Case endings always syncretize GEN and LOC.
- Allowing for these differences, all three varieties show the same major patterns with the same relative frequency. Upshot: we can be confident that at least these are genuine patterns.

(17) Frank (1999); corpus = 252 nouns

	I	II	III	IV	V	X
NOM SG	Ø	Ø	Ø	Ø	Ø	Ø
GEN/LOC SG	Ø	kä	kä	Ø	Ø	kä
NOM PL	Ø	Ø	ni	ni	Ø	Ø
GEN/LOC PL	ni	ni	ni	ni	Ø	Ø
% of corpus:	24	21	18	10	4	---

(18) Crazzolara (1933); corpus = 195 nouns

	I	II	III	IV	V	X
NOM SG	Ø	Ø	Ø	Ø	Ø	Ø
GEN/LOC SG	Ø	ä	ä	Ø	Ø	ä
NOM PL	Ø	Ø	ni	ni	Ø	Ø
GEN/LOC PL	ni	ni	ni	ni	Ø	Ø
% of corpus:	46	24	8	11	7	4

(19) Vandevort (n.d.); corpus = 329 nouns

	I	II	III	IV	V	X
NOM SG	Ø	Ø	Ø	Ø	Ø	Ø
GEN/LOC SG	Ø	ä	ä	Ø	Ø	ä
NOM PL	Ø	Ø	ni	ni	Ø	Ø
GEN/LOC PL	ni	ni	ni	ni	Ø	Ø
% of corpus:	39	27	15	11	6	2

- This yields 6 classes, against a ICET prediction of 8 – but only by accident! The problem in a nutshell:

(20) According to the terms of the ICET, varying distribution of *-ni* in the NOM PL can only be described by positing accidently homophonous $Ø_1$ and $Ø_2$ or *-ni*$_1$ and *-ni*$_2$.

	I		IV
NOM SG	Ø		Ø
GEN/LOC SG	Ø	vs.	Ø
NOM PL	Ø		ni
GEN/LOC PL	ni		ni

(21) Nor can impoverishment help: NOM PL stem may be distinct both from SG and from the rest of PL, independent of presence or absence of *-ni* (data from Frank 1999).

NOM SG	jiɔm	thiik
GEN SG	jiam	thiak
LOC SG	jiam	thiak
NOM PL	jɔam	thik-ni
GEN PL	jiam-ni	thiak-ni
LOC PL	jiam-ni	thiak-ni
	'wind'	'door'

3 Conclusion

Constraints on paradigm structure do not seem to work. Perhaps a more realistic way of thinking about this is through principal parts (e.g. Finkel & Stump 2007; Ackerman, Blevins & Malouf, to appear). Inflection class constraints would then translate into constraints on the number of forms you have to memorize (which is unlikely to make anybody happy).

(22) Dynamic principal parts of classes I-XVI (in terms of Finkel & Stump 2007); shaded cells are principal parts. 2-5 prinicple parts needed.

	I	II	III	IV	V	VI	VII	VIII	IX	X*	XI	XII
NOM SG	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
GEN SG	Ø	kä	kä	Ø	Ø	Ø	Ø	kä	kä	kä	kä	kä
LOC SG	Ø	kä	kä	Ø	Ø	Ø	kä	Ø	Ø	kä	kä	kä
NOM PL	Ø	Ø	ni	ni	Ø	Ø	Ø	ni	Ø	Ø	Ø	Ø
GEN PL	ni	ni	ni	ni	Ø	ni	ni	ni	ni	Ø	ni	Ø
LOC PL	ni	ni	ni	ni	Ø	Ø	ni	ni	ni	Ø	Ø	ni

	XIII	XIV	XV	XVI*
NOM SG	Ø	Ø	Ø	Ø
GEN SG	kä	kä	Ø	Ø
LOC SG	Ø	kä	kä	kä
NOM PL	Ø	ni	ni	Ø
GEN PL	ni	Ø	ni	Ø
LOC PL	Ø	ni	ni	ni

*an alternative set of 3 principal parts is also possible

- On the reasonable assumption that there are some default rules (or Paradigm Structure Conditions in Wurzel's sense), this can be simplified quite a bit. But it's still pretty involved for a system with just 3 affixes.

(23) Let's take class II as the default, which we can derive by the following rules:[2]

i. default ending = Ø
ii. GEN SG = *-kä*
iii. GEN PL = *-ni*
iv. GEN → LOC (a rule of referral: the locative is the same as the genitive)

(24) Revised dynamic principal parts of classes I-XVI, assuming the rules in (23). Shaded cells indicate principal parts that override the default. Gets as high as 4 principal parts.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
NOM SG	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
GEN SG	Ø	kä	kä	Ø	Ø	Ø	Ø	kä	kä	kä	kä	kä
LOC SG	Ø	kä	kä	Ø	Ø	Ø	kä	Ø	Ø	kä	kä	kä
NOM PL	Ø	Ø	ni	ni	Ø	Ø	Ø	ni	Ø	Ø	Ø	Ø
GEN PL	ni	ni	ni	ni	Ø	ni	ni	ni	ni	Ø	ni	Ø
LOC PL	ni	ni	ni	ni	Ø	Ø	ni	ni	ni	Ø	Ø	ni

	XIII	XIV	XV	XVI
NOM SG	Ø	Ø	Ø	Ø
GEN SG	kä	kä	Ø	Ø
LOC SG	Ø	kä	kä	kä
NOM PL	Ø	ni	ni	Ø
GEN PL	ni	Ø	ni	Ø
LOC PL	Ø	ni	ni	ni

- Perhaps this complexity is licensed by the complexity of the stem alternations (see fig. 25), which must be memorized to a great extent (and which no PEC will rein in anyway). If you're memorizing stems, you're presumably memorizing the endings that go with them.

  Note that while the stem alternation pattern and the affixal patterns are largely independent (see figs 15 and 16), there appears to be general rule which allows for some limited predictions. In Frank's corpus, for any given case, the singular and plural forms are different in all but one example. Thus, where there is no stem alternation marking number, it is marked by an affix. This helps predict the choice of the common classes I vs. IV and II vs. III for some lexemes. However, the reverse implication does not hold: where there is a stem alternation marking number, the choice of affixal pattern is unpredicatable.

News flash: an computational principal parts analysis of all this has been implemented. Come to the LAGB meeting in Edinburgh to hear more.

[2] In fact, Frank identifies class III as the default for novel items, which is distinguished by having *–ni* in the nominative plural. But note that novel items also lack a stem alternation, and so would be predicted to have *–ni* in the nominative plural in any case. (Obviously, a more complete formal analysis would have to incorporate this.) I have chosen class II to illustrate a default analysis since it allows for a greater reduction in principal parts.

Note on orthography (breathy voice vowels)

ä = IPA a̤

a̲ = IPA æ̤

ë = IPA e̤

i̲ = IPA i̤

ë = IPA ɛ̤

ɔ̲ = IPA ɔ̤

References

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(25) Stem alternation patterns in Nuer nouns (data from Frank 1999): up to 5 stems, at least 47 different patterns attested. Percent of corpus (252 nouns) not calculated for types with 10 tokens or fewer.

	A A A A A A	A A A B B B	A B B C C C	A B B B B B	A B B C D D	A A A A A B	A A A A B B	A A A B A A	A A A B B C	A A A B C B	A A A B C C	A A B A C B
NOM SG	baan	ŋiɛc	ley	kɔm	thi̱n	böw	ɣöth	juac	rɔany	lath	käk	läm
GEN SG	baan-kä	ŋiɛc-kä	läɣ	kɔam	thi̱än	böw-kä	ɣöth-kä	juac-kä	rɔany-kä	lath	käk-kä	läm-kä
LOC SG	baan	ŋiɛc-kä	läɣ	kɔam	thi̱än	böw-kä	ɣöth-kä	juac-kä	rɔany-kä	lath	käk-kä	la̱m-kä
NOM PL	baa-ni̱	ŋiic	leey	kɔam-ni̱	thin	böw-ni̱	ɣöth-ni̱	juaac	rɔny	laath-ni̱	kääk	läm-ni̱
GEN PL	baa-ni̱	ŋiic-ni̱	leey-ni̱	kɔam-ni̱	thi̱i-ni̱	böw-ni̱	ɣööth-ni̱	juac-ni̱	rɔny-ni̱	la̱ath-ni̱	ka̱ak-ni̱	lääm-ni̱
LOC PL	baa-ni̱	ŋiic-ni̱	leey-ni̱	kɔam-ni̱	thi̱i-ni̱	bööw-ni̱	ɣööth-ni̱	juac-ni̱	rɔɔny	laath-ni̱	ka̱ak-ni̱	la̱m-ni̱
	‘bug’ 27%	‘ant’ 20%	‘animal’ 15%	‘chair’ 6%	‘breast’ 4%	‘goat’	‘basket’	‘grass’	‘cane’	‘cotton’	‘cough’	‘rank’

	A A B B A A	A A B B A B	A A B B B B	A A B B B C	A A B C C C	A A B C C D	A A B C D C	A A B C D D	A B A A A A	A B A A A C	A B A A C D
NOM SG	lil	deth	cua̱r	gɔɔk	puäth	wäär	ji̱om	nyal	ŋulciök	kɔar	to̱ok
GEN SG	lil-kä	deth	cua̱r-kä	gɔɔk-kä	puäth-kä	wäär-kä	ji̱om	nyal	ŋuulciök	kɔr-kä	tɔkto̱k-kä
LOC SG	liɛl	deeth	cueer	gɔak	puth-kä	wa̱ar	jiɔm	nyaal	ŋulciö-kä	kɔar	to̱ok-ä
NOM PL	lil-i̱	deeth	cueer	gɔak-ni̱	pu̱o̱th	wer	jiam	nyi̱är	ŋulciök-ni̱	kɔar-i̱	to̱ok-ni̱
GEN PL	lil-i̱	deth-ni̱	cueer-i̱	gɔak-ni̱	pu̱o̱th-ni̱	wer-i̱	ji̱ɔm-ni̱	nyi̱ät	ŋulciök-ni̱	kɔar-i̱	tɔkto̱k-ni̱
LOC PL	lil-i̱	deeth-ni̱	cueer-i̱	gɔaak-ni̱	pu̱o̱th-ni̱	wär	jiam	nyi̱ät	ŋulciök-ni̱	kɔaar-i̱	tɔkto̱o̱k-ni̱
	‘oxbow lake’	‘load’	‘sky’	‘monkey’	‘lung’	‘dung’	‘Nov-Jan’	‘girl’	‘heel’	tree’	‘pail’

	A B A B B B	A B A C A A	A B A C C B	A B B A A B	A B B A B B	A B B B A A	A B B B B C	A B B B C B	A B B B C C	A B B C A A	A B B C A C	A B B C B B
NOM SG	kɔat	ri̱öp	luak	cäŋ	libɛ	mät	pan	täp	tiik	dɛy	puɔ̱k	ji̱ɔm
GEN SG	kɔt-kä	röp	luaak	cääŋ	lipɛ-kä	ma̱t-kä	paan	ta̱p-kä	tiëk	dɔa	puk-kä	jia̱m
LOC SG	kɔata	ri̱öp-kä	luak	cääŋ	lipɛ-kä	ma̱t-kä	paan	ta̱p-kä	tiëk	dɔa	puk-kä	jia̱m
NOM PL	kɔt	rööp	lueek	cäŋ-ni̱	libɛ-ni̱	ma̱t	paan	ta̱p	tiëk	dɛjuac-ni̱	puuk	jɔam
GEN PL	kɔt-ni̱	ri̱öp-ni̱	lueek-ni̱	cäŋ-ni̱	lipɛ-ni̱	mät-ni̱	paa-ni̱	tääp-ni̱	ti̱ëk-ni̱	dɛy-ni̱	puɔ̱k-ni̱	jia̱m-ni̱
LOC PL	kɔt-ni̱	ri̱öp-ni̱	luaak	cääŋ-ni̱	lipɛ-ni̱	mät-ni̱	pa̱a-ni̱	ta̱p-ni̱	ti̱ëk-ni̱	dɛy-ni̱	puuk-ni̱	jia̱m-ni̱
	‘tamarind’	‘fingernail’	‘barn’	‘sun’	‘needle’	‘narrows’	‘desert’	‘valley’	‘necklace’	‘plant’	‘ash’	‘wind’

	A B B C B D	A B B C C B	A B B C C D	A B B C D C	A B B C D E	A B C A A A	A B C A A C	A B C B B C	A B C A B B	A B C D D D	A B C D A E	A B C D E E
NOM SG	tat	päm	mök	dit	dɛl	ŋɔp	jöŋ	bɔɔ̱r	kɔryɔm	thok	gök	buäw
GEN SG	taat-kä	pa̱a̱m	mo̱k	diɛt	dëël	ŋɔ̱äp	ji̱öŋ-kä	bɔ̱r-kä	kɔryɔam	thuɔk	gɔ̱k-kä	buɔ̱-kä
LOC SG	taat-kä	pa̱a̱m	mo̱k	diɛt	dëël	ŋɔ̱ääp	ji̱oŋ	bɔ̱är-kä	kɔryiöm-kä	thɔk	go̱k-kä	bɔ̱w-kä
NOM PL	tät	pääm	möök	diit	det	ŋɔp-ni̱	jöŋ-ni̱	bɔ̱r-i̱	kɔryɔm-ni̱	thuuk	göök	bɔɔ̱w
GEN PL	taat-ni̱	pääm-ni̱	möök-ni̱	diin	dëët-ni̱	ŋɔp-ni̱	jöŋ-ni̱	bɔ̱r-i̱	kɔryɔam-ni̱	thuuk-ni̱	gök-kä	bɔ̱äw-ni̱
LOC PL	ta̱a̱t-ni̱	pa̱a̱m-ni̱	mo̱k-ni̱	diit-ni̱	deet	ŋɔp-ni̱	ji̱oŋ-ni̱	bɔ̱är-i̱	kɔryɔam-ni̱	thuuk-ni̱	goo̱k-ni̱	bɔ̱äw-ni̱
	‘buttock’	‘mountain’	‘buffalo’	‘song’	‘goat’	‘kind of tree’	‘table’	‘water plant’	‘locust’	‘mouth’	‘bag’	‘kind of tree’

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